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ABSTRACT

In this paper, two theoretical approaches to language teaching, the audio-lingual and the cognitive code methods, are examined with respect to how they deal with feedback in the classroom situation. Audio-lingual theorists either ignore completely the need for feedback in the classroom or deal with it only in terms of its reinforcing attributes. When it is provided in terms of results, it is usually in reaction to a correct response ir an effort to make the recurrence of that response more likely. Cognitive code theorists or transformationalists insist that language learning takes place on an inner level, not necessarily reflected by outward performance. This concept makes feedback, which must be based on outward performance, inappropriate. A cybernetic model is suggested here as the basis for constructing a language learning theory that incorporates features of both cognitive-code learning theory and audio-lingual habit theory and recognizes the importance of feedback. After a summary of cybernetic theory, the kind of feedback it entails, how it can be applied to language learning and what its implications are for the learning process are discussed. (PMP)

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Feedback in Language Teaching

Teaching a foreign language is unlike teaching any other discipline, for it is the one area of instruction that deliberately aims at the reproduction, memorization or automatic mastery of specifically taught verbal patterns.[1] The ability to readily and fluently make use of these patterns indicates that learning has taken place. Mechanical repetition and rote learning, which are anathema to education,[2] become demonstrations of competence. Because of the great stress on and significance given to reproduction, feedback is a crucial element in the language teaching process. The very nature of language acquisition depends upon receiving feedback concerning one's performance. How else is the student to ascertain whether or not he has responded or spoken correctly?

It is thus somewhat ironic that most of the literature concerning language teaching has ignored this issue. Moreover, when feedback has been dealt with, its role has been realized as motivational and/or reinforcing, rather than informational. The implications of this are twofold: teacher and student are independent of one another, the former providing a model and sporadically rewarding or punishing, the latter imitating that model; the student can learn to speak a second language without necessarily understanding what he is saying[3] nor the principles which underlie his responses. In order for real learning to occur, when understanding and performance become inner and outer conterparts of the same process, feedback must be more than the provision of sanctions; it must "proceed backward from the performance [so as] to change the general method and pattern of performance." 4 Because feedback can be tantamount to learning a second language, it is my intention to review how the literature concerning the methodology of language teaching has either dealt or not dealt with feedback. I will then discuss informational feedback and its implications. This approach to feed-

back will also provide the rationale by which theories which have been antithetical can be reconciled and synthesized. Finally, competence and performance, too often separate experiences in the language learning process, will be seen as occurring concomitantly.

For the most part, the literature concerning language teaching describes and prescribes one of two theoretical approaches, the audio-lingual, which explains language learning in terms of verbal habits, and the cognitive-code which views language competency in terms of the comprehension of rules.[5] While one is based upon continuous practice and drill, the other emphasizes understanding the underlying principles of the language. What is crucial from the standpoint of this paper, however, is not which approach should be adopted or which provides for greater achievement. (As a matter of fact, results of studies comparing the two approaches show that one is not superior to the other.[6]) Rather, the main concern here is that, whatever the theoretical approach, the emphasis, is on methodology. Whether it be the impartation of a set of drills or rules, the main issue is on the teaching of languages, as if that in itself insures learning. The role of teacher is either that of model or lecturer. The dynamic role he could be playing in terms of language learning is largely left unrecognized. It would be worthwhile to look at each approach in order to discover not only how it does or does not treat feedback, but what this treatment indicates.

The audio-lingual theory is based upon the experimentation of the behaviorist school of psychology. Learning took place when stimulus-response connections were strengthened and became automatic habits.[7] Convinced that these findings could be applied to the classroom and that the grammar-translation method was failing miserably, educators espoused that "the single paramount fact about language learning is that it concerns ... the formation and performance of habits."[8] Language was seen as a "system of recur-

ring sequences or patterns,"[9] a "mode of sounds"[10] or "verbal responses made [under] various stimulus conditions."[11] These patterns would become habits by virtue of practice, repetition and drill, establishing themselves in the learners' minds.[12] While the structuralists, (as the advocates of behaviorist theory and the audio-lingual method came to be called,) carefully qualified their positions by insisting on meaningful drill, language learning essentially became mechanical repetition and mimicry. In its extreme form, habit, rather than learning to communicate in a second language was the goal; "the habits we have formed determine for us what is sensible and what is senseless."[13]

Frequency of repetition alone, however, did not insure the occurrence of behavior changes. Reinforcement, some kind of after-effect, a reward or punishment, was necessary in order to shape or condition the desired behavior.[14] In the learning situation, this provided information about the performance and thus was called "knowledge of results." Countless studies have been carried out, the results of which indicate that reinforcement in terms of "knowledge of results" is a necessary component of learning.[15] In language learning, it is the only means by which a student finds out whether his performance was correct or incorrect. Yet, not only is there considerable dispute as to whether learning can occur without providing this kind of reinforcement, but teachers imply in their teaching practice that learning occurs as of result of the "simultaneous occurrence of the stimulus and response ... without other factors operating."[16] Moreover, when "knowledge of results" is indeed administered it's usually done in the form of sanctions which are purely motivational in function. The directional or informational aspects of feedback are totally ignored, very often leading students to make erroneous conclusions as to the correctness of their responses.

The theoretical approach just described thus works on the premise that

language learning consists of practicing drills and patterns which eventually become automatic habits. Reinforcement, for the most part, strengthens these habits and helps shape the behavior, but is not intrinsically related to what is being taught. Because structuralists are convinced that this methodology cannot help but result in learning the proper responses, the question of error and how to treat it is not taken into account. Though it is admitted that error might occur, its occurrence is explained in behavioristic terms: interference in learning the second language is due to knowledge of the first.[17] Accepting this theory of contrastive analysis, the methodology used in the classroom is such that interference is avoided. Error therefore need not be dealt with because the possibility of its occurrence is obviated by the audio-lingual approach; "repetition reduces errors by making some sequences of symbols more likely than others."[18] If, however, despite the drill and repetition, error does occur, the teacher is advised to pass over rather than deal with it, providing instead the correct form.[19] Thus, we have a paradoxical situation: language learning whose very nature is fraught with the possibility of error, is assumed to occur without error.

Taking this assumption into account, it becomes clear why feedback has either been ignored or dealt with only in terms of its reinforcing attributes. When however, it is provided in terms of results, "it is usually in reaction to a correct response, thus making the recurrence of that response likely. Error, on the other hand, is generally not acknowledged, this despite the studies indicating the importance of informing the student that his answer is wrong.[20] Moreover, if negative reinforcement is provided, it is usually non-specific, not lessening the likelihood of the error's recurrence. Negative feedback which is informational and which deals with the actual behavior is rarely used.[21]

A behavioristic approach to language learning stresses empirical evidence and rejects as "irrelevant all responses that cannot be observed and recorded."[22] Learning is said to have taken place when particular behaviors, having been shaped and conditioned, become manifested. Teachers are exhorted not to waste time in explanations and rules,[23] for it is the reiteration of the model's patterns that is both the means and end of language instruction. Given this framework, the concern is not whether a student has grasped the underlying principles or has formed any generalizations or formulas. Rather, performance, not understanding, is the essential element. It is with this insistence upon empirical evidence and rejection of teaching the essential rules of language that the cognitive-code theorists or transformationalists take issue. Language learning is viewed as too complex a process to be explained by the mere contiguity of stimulus and response and its reinforcement; rather it entails the understanding of principles, generalizations and relationships which account for the outward verbal manifestations of the student.[24] The learner can do more than passively imitate; he has the capacity to comprehend and actively manipulate the knowledge imparted to him.

In terms of the classroom, this implies that students would be taught rules and principles and provided with explanations. The crucial issue would not be the exactitude of a correct response but the comprehension of the principle which underlies it. As a result there might not be enough opportunity to practice representative samples of the principle. Unlike the behaviorists who recognized performance only, this school of thought gives priority to competence; it studies "what the speaker might say, not just what he says."[25] Operating on this premise the role of feedback (in terms of "knowledge of results") becomes questionable, for while it may influence outward verbal performance, it may have nothing to do with inner mental processes producing the behavior. Correct responses need not be positively re-

inforced because it is assumed they indicate comprehension. At the same time, negatively reinforcing incorrect responses is inappropriate, for errors are not necessarily attributable to interference or negative transfer; rather they may be systematic, indicating that the learner is consciously constructing and forming hypotheses.[26] While one might here suggest that feedback providing the learner with additional information would certainly fit into the cognitive-code framework, it soon becomes obvious why this is not the case: the insistence that learning takes place on an inner level, not necessarily represented by the outward performance, makes feedback which must be based on outward performance inappropriate.

Having reviewed the two major theoretical approaches to language learning, it seems that each is preoccupied with its own particular emphasis and methodology, thereby rendering one exclusive of the other. It is obvious that this kind of polarity can make the process of learning a very narrow and rigid experience, for each side focuses on certain processes, assuming that others are less significant. For language learning this can be crucial since, taken to its extreme, the results could be automatic mimics who have understood nothing but outwardly seem to have learned, or knowledgeable students who have grasped the important generalizations but are not capable of actively using the language. Because of the negative implications of pitting one approach against the other, attempts have been made to synthesize the two.[27] It was felt that what was needed was a "model that incorporates features of both cognitive-code learning theory and audio-lingual habit theory."[28] Rather than a theoretical model with a rationale by which this synthesis could be explained and understood, however, the result has been either a pastiche of the important elements of each approach[29] or an argument which attempts to demonstrate that the existing antithesis is due more to interpretation than any real contradiction.[30] In either case, we are not provided with a

satisfactory and comprehensive model, one which not only describes the important elements being seized upon and reconciled, but explains how and why such a reconciliation is possible.

What we essentially need then is a theory based on the premises that the ability to make automatic verbal responses entails inner mental processes and that it is the outward realization of these responses that provides a true index of the inner organization. Given the rather negligible treatment of feedback in language learning, it is ironic that a cybernetic approach to learning should provide us with such a theory. Before demonstrating, however, how and why this synthesis is possible, via the cybernetic paradigm, it is necessary to discuss what cybernetics is, what kind of feedback it entails, how it can be applied to language learning and what its implications are for the learning process.

Cybernetics, a term coined by Norbert Wiener, deals with the "entire field of control and communication theory, whether in the machine or in the animal."[31] It is based on the premise that information transmitted or "fed back" to the receiver can be used as new input and so alter the system's future performance or output: "to act effectively, it is necessary that information concerning the results of [ones] actions be furnished as part of the information on which it must continue to act."[32] It must be understood, however, that the information we are here dealing with is not the "knowledge of results" type of feedback operating as reinforcement and motivation. We are not interested in "brute and blunt" information, but information on which we can act effectively, "information which penetrates into a communication and storage apparatus sufficiently to serve as a trigger for action."[33]

This "apparatus" is another concept crucial to the cybernetic model. Its existence explains why feedback, when transmitted effectively, can indeed have an impact on future performance. The receiver of the message, in

this case the human learner, is not a simple, uni-dimensional conditioned subject, as behaviorists would have us believe. Rather, he has formed and operates according to a hierarchy of plans or systems.[34] Thus, in order that his future behavior or performance be changed meaningfully, the underlying plans must somehow be reorganized or restructured. If the feedback is simply informing the student that his response was correct or incorrect or providing him results in terms of numerical data, it is unlikely to have a real impact on the structures upon which his performance was based. If, however, "the information which proceeds backward from the performance is able to change the general method and pattern of performance, we have a process which may be called learning."[35]

Before translating what all of this means in terms of language teaching, it is necessary to deal with one other factor basic to Wiener's conceptualization of feedback, entropy. While communication takes place, while messages are being transmitted or while information is being imparted, entropy, a kind of disintegration or destruction of meaning will occur.[36] This tendency toward disorganization is inevitable, caused by virtue of the fact that communication is taking place. This, however, is not totally negativistic, and we need not despair of ever being able to transmit our meaning. Rather, the realization that entropy occurs underlines the importance of transmitting our messages as clearly as possible. This is the one recourse we have to either minimize or neutralize its effects. It is obvious how crucial this realization is for teaching, especially the teaching of a second language, where the task being set by the teacher is often ambiguous. Moreover, the feedback provided (if, at all) rarely clarifies any of the confusion the student may be experiencing. Thus, entropy and its effects, which ipso facto occur, not only are not counteracted, but are multiplied in the language classroom. Teachers give little thought to how clear they are making themselves

in either structuring a task or in providing feedback which they expect will result in improvement.

The foregoing discussion of cybernetic theory, the feedback it is based upon and the rationale for this kind of feedback, (so that the system's underlying structure is reorganized by the new input and, so that the disorganizing effects of entropy are minimized) was a necessary preface to the consideration of information feedback in language teaching; it defined what it is that is being aimed at and why. Before proceeding with the application of cybernetics to teaching, it should be reiterated that, for the most part, feedback has been neglected in language classrooms in favor of a preoccupation with methodology. Numerous studies have been done comparing the effects of reinforcement with those of informational feedback on learning, the results of which suggest that there is a correlation between superior performance and informational feedback.[37] It has even been demonstrated how cybernetics specifically applies to the teaching - learning process, taking into account all of Wiener's basic tenets.[38] Yet, in the language classroom, (where feedback seems to me to be critical,) questions remain unanswered. How can the language teacher employ the cybernetic model? What kind of information should be transmitted to the student? What assumptions are to be made about the mental processes and inner organization of the learner? How do these assumptions affect our choice as to the kind of information communicated? Does cybernetics imply that, as teachers, we provide the basic rules of the language so that they are encoded by the learner within his hierarchy of plans? If this is the case, can we expect that such knowledge will guarantee good language performance? If, on the other hand, we provide him with patterns to drill, how do they fit into his inner schemata? A look at how some of the literature on the learning process has taken communication theory into account can help answer these questions and thereby demonstrate how

cybernetics can be applied to language teaching. It is because cybernetics is based upon the unambiguous transmission and communication of information that its application to language instruction is particularly appropriate.

Working within Wiener's cybernetic framework, the receiver or decoder of messages is realized as the language learner. The role of the student changes dramatically and takes on new dimensions. Rather than a passive participant, in the sense that the pupil either becomes conditioned to emit certain responses or memorizes rules and principles, we have an active and dynamic performer. Information is not merely received; it is utilized, resulting in some kind of inner reconstruction. Given this picture of the student, the nature of the messages communicated becomes all-important. If, as teachers, we desire and expect a particular performance, we must make sure that the student knows what we are asking for and understands the information we return,[39] for a student's awareness of the intended behavior affects the performance.[40] This is crucial in the language classroom where one of the greatest causes of error is due to the fact that students have misread or miscoded the teacher's signals. This occurs not so much because they are incapable of comprehending, but rather because the teacher's message is ambiguous. Unaware of the cause of the problem, the teacher resigns himself to the fact that the task is either too complex or, worse, that his students are incompetent. It is imperative, then, that the information we feed back to the pupils be the kind which not only is understood in terms of the actual meaning, but which sharply defines what tasks we are setting. Only in this way can the communication have any real impact on the inner processes which we want to set into operation. Only in this way do we have a real feedback "loop".

Like the role of the student, the role of the teacher has also taken on new dimensions. It is not enough to provide a model for the student and assume

that the mechanical reproduction of certain utterances indicates that information has been taken in and utilized and learning has therefore taken place. Similarly, it is naive to expect that active and automatic language performance will result from the provision of rules and generalizations. Rather, the language teacher must pay close attention to the clarity of his message, whether the student understands explicitely what is being asked of him, whether the information is capable of being decoded and whether the learner will be able to act upon it. In a situtation like the language class, where there is a high probability of confusion, it is essential that the teacher provide feedback which is truly informative, which delineates what is expected, for "the mere existence of a feedback loop does not guarantee goal - directed activity."[41] As long as we attempt to keep our communication as free of ambiguity as possible and "formulate... information we... feed back, there is no extent to which [we] can improve [behavior.]"[42]

While this discussion is mainly concerned with the verbal aspects of feedback in the language classroom, a slight digression in order to consider its non-verbal aspects is not inappropriate. How non-verbal feedback has or, rather, has not been dealt with in language teaching closely parallels the situation of informational feedback. Just as little attention has been given to the kind of information transmitted in the teacher's verbal reactions, the regard given to non-verbal communication has been negligible.[43] To carry the analogy further, just as there is often a great deal of confusion resulting from the teacher's failure to make clear the goal to be achieved, a contradiction often exists between what the teacher says and what the teacher communicates non-verbally.[44] In the same way that the teacher is not aware of the ambiguity with which his verbal message is loaded, he is unaware that his non-verbal expressions and gestures might be negating whatever information his verbal behavior is conveying. It stands to reason that in the language class-

room, where an intrinsic barrier exists, that is, the second language, a great deal of non-verbal behavior will be attended to. If, therefore, the non-verbal does not corroborate its verbal counterpart, the intentions of the teacher are likely to be misread. Thus, here again, the necessity is to avoid confusion, to make sure that even what is transmitted non-verbally indicates what is desired so that the student can use the information in his future performance.

Cybernetic theory would have little value for language teaching if its only implication were that feedback contain unambiguous information which the student can comprehend and act upon. While the teacher might accept this premise upon which to base his instruction, it does not necessarily follow that he would be able to actualize it in the language classroom. In other words, unless this theory of communcation tells us not just what we must do in the abstract, but defines how to reduce ambiguity, not just that information be transmitted, but what kind of information, it has very little application value. The interest in communication theory, however, has resulted in the study of the reduction of classroom ambiguity in concrete and specific terms. By taking into account the student's mental processes and the goal of the instruction, inferences have been made about the specific feedback to be used.

In order to account for the specific kind of information to be conveyed, it is necessary to understand more explicitely what the existence of underlying constructs entails. As already pointed out, it means that the student is not a planless performer who is shaped and conditioned, but rather an "active and selective information-gathering individual who acquires and inerprets new knowledge on the basis of rules already stored in the brain".[45] What this means in terms of language learning is that the responses produced by the pupil demonstrate not his capacity to memorize and mimic, but his attempt to test hypotheses and try out responses which have become part of his repertoire of behavior; he "brings a highly structured knowledge of the world into every...

situation.[46] The learner is making choices and his decisions are based not only on the particular stimulus that is being presented to him at any given moment, but also on how that stimulus fits into his underlying plans.

Thus, the response made is symbolic of the learner's manipulation of both the present and previous experiences with the language. To say that the learner's behavior is the result of inner processes does not, however, explain how these decisions and hypotheses are realized. What makes the inner organization of the language learner make him respond in a certain way? What is his reference? Frank Smith's book, Understanding Reading, is concerned with answering these questions.[47] While dealing specifically with how learning to read takes place, his survey offers many insights which are readily applicable to learning a second language. The student forms rules and hypotheses which he subsequently tests out. These rules and hypotheses are based on previously established categories, each of which is represented by a set of critical or distinguishing features. In other words, the learner perceives distinctions or similarities in the language presented to him and then creates categories for these features. This system of categories allows him to come to some conclusions or form some rules by which he can operate. And it is these rules which are tested out when confronting new information. If the new information complies with a particular rule or, more specifically, with criteria of a given category, it becomes assimilated into that category. If, on the other hand, the information is not represented by existing "criterial sets," a new category must be created. In either case, some kind of internal reconstruction takes place. The individual is not necessarily aware of this reconstruction and process; rather, it seems as if what he now perceives is derived from the immediate information or input.[48]

The ability to perceive relationships or make discriminations and associations and organize them into some sort of system is the human realization of what occurs at the receiving end of a cybernetic system. It is only after having taken into account the underlying plans, how they are organized and the kind of information that is or is not accessible to them, that specific informational feedback can be dealt with; it is the underlying constructs which determine the messages transmitted and if those messages can be received and decoded. If, then, the student creates categories, makes discriminations, tests hypotheses, reconstructs plans and thus learns, it follows that the feedback transmitted should be so designed that new information can be extracted and used in his processes. The limitations of a "knowledge of results" becomes clearly evident: positive reinforcement doesn't provide him with anything he already did not know, while negative reinforcement doesn't indicate the dimension or cause of his error, thereby not providing the new input necessary for avoiding the error next time. He knows that he is right or wrong, but does not know why.

Feedback which will transmit information must take into account that while the student is discovering feature lists or criterial sets, establishing categories and testing hypotheses, he is choosing from among many alternatives. The number of alternatives is an index of the amount of uncertainty he faces.[49] If the learner perceives just one alternative and chooses accordingly, there is no uncertainty, ambiguity or, in communication terminology, noise. If, however, there are many alternatives from which he must make a choice, he is experiencing a great deal of uncertainty. The feedback is informational to the extent that it reduces the uncertainty or number of alternatives. Feedback which does not carry new information does not reduce alternatives and has no impact on the underlying constructs and rules the learner uses to organize the incoming messages.

We have previously seen how probable the occurrence of ambiguity in the language classroom is. The teacher, ignorant of the contradictions between his message and his meaning, thus does not only reduce the number of alternatives, but creates even more uncertainty. The language learner cannot extract any information which will reduce the number of alternative choices and may even be faced with greater ambiguity. For example, if the student utters "He going," unsure of its correctness, and the teacher's reaction is "Again, please," the student now has to figure out whether he is to repeat his answer or whether his performance should somehow be altered. If he does the former, he soon finds out that he misread the teacher's message and still has not had any alternatives reduced. If he tries to do the latter, his next response is based on the same number of alternatives as his first, for there has been no reduction of uncertainty. If the teacher's intention was that "is" be inserted, his doing so, rather than responding "He goes," is fortuitous, not necessarily an indication that he has learned the desired response. Similar to the consequences of providing positive or negative reinforcement, demanding constant repetition, an activity prevalent in many language classes, does not reduce the alternatives and does not provide information upon which future decisions can be based.

Having discovered why certain types of feedback should be avoided, because they are either ineffective or even detrimental, the question of what kind of feedback reduces ambiguity still remains to be answered. Is the uncertainty reduced by providing rules and principles which the student incorporates into his inner organization or by providing the correct patterns to be reproduced? Because learning involves the self-discovery of rules and principles, outrightly providing these as feedback will give students little opportunity to discover them for themselves. Similarly,

feedback providing for haphazard pattern practice and repetition might strengthen the correct response, but is unlikely to result in the formulation of rules necessary for the perception of discriminations, associations and relationships. What the teacher must do, then, is provide feedback which delineates the salient or critical features of a task. Information which identifies what exactly is to be learned and that allows the student to see distinctions and similarities is what is meant by feedback which reduces ambiguity. Thus, after carefully planning practice so that an underlying principle becomes internalized, the teacher's feedback must continue to process information so that the hypotheses being tested are either confirmed or rejected. By continuously providing analogous and contrasting instances of a certain response, the student is receiving new information;[50] critical features have been delineated and become incorporated into previously established categories, resulting in the reduction of ambiguity or learning. In other words, the use of analogy and contrast is much more effective than frequent repetition, for it allows the student to understand why his response is correct or incorrect.

The necessity to contrast means that both what something is as well as what it is not should be focused upon. This has some interesting implications for the treatment of error. During most language instruction, errors are either ignored by continued practice with the correct response or reinforced negatively. As far as the language teacher is concerned, they are to be avoided and drilled out of the learner's repertoire of responses; their occurrence indicates that learning has not taken place either because of interference from the first language or failure to grasp the important principles involved.[51] If, however, it is recognized that the student is testing hypotheses, then errors indicate not that he has not learned, but rather that he is in the process of doing so. This means that

when an error occurs, the feedback should point out where the disparity between the response and the desired response lies. If the "difference between them is not expressly taught, the teacher may not have occasion to discover that the distinction has never occurred to the student."[52]

Though it has generally been considered taboo in language instruction to focus upon the error, for fear that it be learned, studies have shown that superior learning results when both incorrect and correct alternatives have been presented.[53] Furthermore, if we accept error as a necessary aspect of the learning process, rather than ignore it or treat it negatively, it is also likely that the student will take greater risk in testing out his hypotheses. In his discussion of signal-detection theory, Smith points out that risks taken depend upon the "price" paid for making errors.[54] If the cost is too high, few risks will be taken. In the language classroom where learning correct responses depends to a large extent upon making them in the first place, risks (in the form of responses) must be taken. The teacher then must keep in mind the feedback he is transmitting when risks result in error. (Incidentally, according to signal-detection theory, error is inevitable since, contrary to popular belief, the greater the amount of hits or correct responses, the greater will be the amount of misses, or incorrect responses.) The teacher must make sure that he is informing and reducing ambiguity, and thus lowering the cost of taking a risk, rather than reprimanding him, thus raising the cost. Focusing upon errors made, not the students who made them, and more importantly, indicating specifically where the error lies is therefore an informing and positive experience. Students themselves have indicated that more of this type of feedback, despite the fact that it entails pointing out errors, be provided in the learning situation.[55]

During this discussion of feedback, the point that has been continuously underlined is the necessity of feedback which reduces alternatives. Feedback with little information has no effect on the existent uncertainty; it merely reinforces what the student already knows. It does not follow, however, that we should try to "load" our feedback with as much information as possible. The pupil, like the decoder of a transmission system, has a limited capacity and is only able to receive and comprehend just so much of a message; providing too much information not only does not reduce noise, but creates further ambiguity. It is therefore essential that informational feedback be structured so as to provide for redundancy, for when redundancy exists, alternatives are reduced.[56] Thus, while constant repetition is ineffective, providing the language learner with no new input, totally new information, which does not take into account what has still not been comprehended, is detrimental. In order to provide for redundancy or partial predictability, the feedback must transmit information which the student receives and incorporates and, at the same time, must allow him to rely upon prior knowledge more readily. As a result, the number of choices or alternatives is reduced.

By providing for redundancy in our feedback, we enable the student to grasp the new information. This is particularly important in second language instruction where a message transmitted in a foreign language ipso facto presents difficulties. Added to this are the different levels of the language that the student must attend to. The language teacher must therefore make sure that the feedback is redundant and alleviates this confusing state of affairs; the feedback must allow the student to recognize distinctions and associations which he had not been able to see previously. When redundancy occurs, the "morphological, phonological and syntactical formations reinforce each other,"[57] and the alternatives in question are reduced to one.

When feedback presents the message in a wide variety of media, redundancy exists. Contrary to the audio-lingual approach which emphasizes the ability to speak before being exposed to the written symbols, the theory of communication stresses the use of different channels of transmission. This is based on the fact that information presented through more than one source becomes redundant and can be comprehended with greater efficiency. In providing feedback, therefore, the teacher should attempt to duplicate the information, not through repetition, but through different sources. By feeding back cues which are not only oral, but visual and/or non-verbal, we are providing for redundancy; the difficulty involved in dealing with the verbal material is lessened because it has been presented through channels which have been left relatively untaxed. Moreover, while this procedure makes more demands upon the teacher when providing feedback, it actually eases the difficulty of making himself understood. Learning occurs more immediately and readily: whereas one source of information may not have been adequate, a combination of more than one is likely to provide for comprehension.[58]

It should be remembered, however, that the rationale for duplicating the information in other ways is to provide for redundancy. This does not mean that new information should be provided through a variety of channels simultaneously. This may be the first time the student is exposed to the information, and he therefore will not be able to attend to more than one source.[59] It is only after a message has been received (and understood) that subsequent feedback should offer the same information through a different channel. Otherwise, not only is redundancy not achieved, but the very purpose of a variety of sources may be negated; instead of a reduction of uncertainty, what we have is the creation of more ambiguity.

The kind of feedback we have been discussing has implications that go beyond the nature of feedback itself: it says something about the

relationship of student and teacher. Instead of the static classroom roles they traditionally have played (demonstrated by studies of the linguistic behavior in the classroom),[60] they have become part of a communication system which entails reciprocity, dependence and continual interaction.[61] The teacher and student are no longer separate elements, one having no effect upon the other. Rather, cybernetics and the communication process it is based upon have made the two part of an organized unit. Wiener called this phenomenon "coupling,"[62] and its very existence determines whether feedback has informational value. Feedback to a student's response or behavior is effective only when it specifically relates to the student's performance; the amount of raw information it carries matters little if feedback has not taken the receiver into account.

The specificity of feedback is so crucial that even the channel through which it is transmitted is not critical. Whether the information is presented visually or orally has been shown to be of little consequence.[63] It is upon this principle that a method which reduces the utterances of the teacher to a minimum and which is totally non-verbal in teacher feedback can achieve any degree of success.[64] Called "The Silent Way," feedback from the teacher is provided through visual cues and non-verbal gestures. The students learn to make correct responses because the feedback is a consequence of their performance. Even when the very goal of instruction is oral expression, non-verbal feedback which specifically relates to the student's response is more informational than verbal feedback which is unrelated to a particular aspect of the student's performance.

Linking the student and teacher together in a communication system means that feedback is really traveling in two directions; information is transmitted both to the student and the teacher. At the same time that the

teacher's reaction carries a message to the student, the student's performance indicates to the teacher the efficacy of the message. Furthermore, the information sent to one part of the system becomes the basis of operation for and activates the other. Thus, the teacher's output becomes the input for the student and determines his future performance, and the student's output becomes the input for the teacher and determines his reaction to that performance. In a sense, teaching and learning are no longer exclusive roles, and become the provinces of both performers in the classroom: while the teacher instructs, he is learning about what must be done next, and while the student learns, he is giving instruction as to what information he is lacking.

Informational feedback and its many implications have been examined in great detail. This discussion is not complete, however, until we go back and again look at an earlier matter, namely, the synthesis of the two theoretical approaches to language teaching. Instead of dealing with the issue then, outrightly describing how the cybernetic model provided for a reconciliation embracing both theories, I chose to leave the question open. This decision was deliberate, based on the premise that the discussion of feedback and what it entails would provide the information necessary to answer this question. I was attempting to create a feedback loop for the reader, presenting information which could proceed backward and reduce whatever uncertainty the question raised. Keeping in mind, however, one of the major tenets of communication theory, that the transmitter (in this case, writer) should never assume what the receiver (reader) has understood or learned, my final comments will deal more explicitly with the question of synthesis. I will thus either be reducing any remaining ambiguity or providing for redundancy.

The cybernetic model is a complex system based upon underlying plans or constructs which extract information from the environment. When the information is incorporated into the system, altering its design and affecting its future performance, it is said to have learned. This process is essentially what cognitive-code theorists have described as learning: using the internal mental processes, students are capable of manipulating incoming messages so that rules and principles upon which the information is based is comprehended. Though cognitive-code theory and cybernetics both stress the importance of grasping the essential elements of the input, the analogy between them ends here; while the former advocates providing these essentials as the raw material to be transmitted, the latter operates on the premise that rules and principles must be self-realized. The cybernetic model now begins to embrace aspects of behaviorist theory, for the information provided is some parallel or contrasting instance of the student's response, thus presenting patterns, not rules and generalizations. Furthermore, the cybernetic system operates on the premise that overt, observable performance is an indication that the new information has been received and integrated into the underlying constructs. The information fed back is determined by the empirical evidence, by what the student has done or said, not by what he might have been capable of or what the teacher expected.

This "cybernetic synthesis" is unlike others which simply prescribe that elements from both theories be extracted and used in one's teaching. It provides a rationale for the reconciliation, explaining how the two approaches to language teaching are really operating simultaneously. Thus, while inner mental constructs are in operation, attempting to grasp the essential elements, the information transmitted is not the rule or principle itself, but representative data of that principle. And, when a reorganization

of these constructs occurs, it is the student's actual response, not possible ones, that is an index of such a reconstruction. It is this last point that does away with the distinction that often exists between learning and performance; whereas the behaviorists are convinced that uttering correct responses indicates learning the language, though that is not necessarily the case, cognitive-code theorists insist that learning occurs, outward performance notwithstanding. Through cybernetics and its synthesis of theories, the aim of language teaching can approach realization: performance and learning, the former the outward manifestation of the latter, become one.

Footnotes

[1]Robert L. Politzer, Foreign Language Learning: A Linguistic Study (Englewood Cliffs, N.J.: Prentice Hall, 1965), p. 13.

[2]Paul Goodman, Compulsory Mis-education and the Community of Scholars (New York: Random House, 1964), pp. 26-153 passim.

[3]Wilga M. Rivers, The Psychologist and the Foreign Language Teacher (Chicago: University of Chicago Press, 1964), p. 20.

[4]Norbert Wiener, The Human Use of Human Behavior (New York: Houghton Mifflin Co., 1954), p. 84.

[5]Leon A. Jakobovits, Foreign Language Learning: A Psycholinguistic Analysis of the Issues (Rowley, Mass.: Newbury House, 1970), p. 223.

[6]See John B. Carroll, "The Contributions of Psychological Theory and Educational Research to the Teaching of Foreign Languages," in Trends in Language Teaching, ed. Albert Valdman (New York: McGraw-Hill, 1966), p. 103; and Kenneth D. Chastain, "A Methodological Study Comparing the Audio-lingual Habit Theory and the Cognitive-Code Learning Theory - A Continuation," Modern Language Journal 54 (April 1970):265-66.

[7]John Annett, Feedback and Human Behavior (Baltimore, Md.: Penguin Books, 1969), p. 31.

[8]Nelson Brooks, Language and Language Learning (New York: Harcourt, Brace & World, 1960), p. 47.

[9]Charles C. Fries, Linguistics: The Study of Language (New York: Holt, Rinehart & Winston, 1964), p. 79.

[10]Politzer, Foreign Language Learning, p. 3.

[11]John B. Carroll, The Study of Language (Cambridge: Harvard University Press, 1955), p. 78.

[12]See Dwight Bolinger, "The Theorist and the Language Teacher," in Teaching English as a Second Language: A Book of Readings, ed. Harold B. Allen (New York: McGraw-Hill, 1972), p. 24; and F. L. Billows, The Techniques of Language Teaching (London: Longmans, Green & Co., 1961), p. 5.

[13]George A. Miller, Language and Communication (New York: McGraw-Hill, 1951), p. 199.

[14]See Robert M.W. Travers, Essentials of Learning (New York: Macmillan Co., 1967), p. 18; Emma Birkmaier, "Some Psychological Aspects of Language Learning," in Foreign Languages and the School: A Book of Readings, ed. Mildred R. Donoghue (Dubuque, Iowa: William C. Brown Co., 1967), p. 112; Miller, Language and Communication, p. 166, and Annett, Feedback, p. 94.

[15]See William Geller and Earl Lower, "Informative Feedback: An Educational Controversy," School and Society 99 (November 1971):418; L. I. Cummings et al., "Performance and Knowledge of Results as Determinants of Goal Setting," Journal of Applied Psychology 55 (December 1971):529; David C. Hughes, "An Experimental Investigation of the Effects of Pupil Responding and Teacher Reacting on Pupil Achievement," American Educational Research Journal 10 (Winter 1973):35; and George A. Johnson, "Motivation, Performance and Satisfaction: An Application of a Conceptual Model to the Classroom," Education 93 (April 1973):331.

[16]Travers, Essentials of Learning, p. 12.

[17]See M. F. Bureau, "Students' Errors and the Learning of French as a Second Language," International Review of Applied Linguistics 8 (May 1970): 140; Libuse Duskova, "On Sources of Errors in Foreign Language Learning," International Review of Applied Linguistics 7 (February 1969):25; Robert L. Politzer and Arnulfo G. Ramirez, "An Error Analysis of the Spoken English of Mexican American Pupils in a Bilingual School and a Monolingual School," Language Learning 23 (June 1973):59; and Ronald Wardhaugh, "The Contrastive Analysis Hypothesis," TESOL Quarterly 4 (June 1970):124.

[18]Miller, Language and Communication, p. 106.

[19]See Mary Finocchiaro, Teaching English as a Second Language (New York: Harper & Row, 1959), p. 92; and Billows, Techniques of Language Teaching, p. 14.

[20]See Alexander M. Buchwald, "Experimental Alternatives in the Effectiveness of Verbal Reinforcement Combinations," Journal of Experimental Psychology 57 (June 1959):359-60; Carolyn Curry, "Supplementary Report: The Effects of Verbal Reinforcement Combinations on Learning in Children," Journal of Experimental Psychology 59 (June 1960):434; Hermine H. Marshall, "The Effect of Punishment on Children: A Review of the Literature and a Suggested Hypothesis," Journal of Genetic Psychology 106 (March 1965):24-25; Janet T. Spence, "Verbal Discrimination Performance Under Different Verbal Reinforcement Combinations," Journal of Experimental Psychology 67 (February 1964):195; and Robert M.W. Travers, et al., "Learning as a Consequence of the Learner's Task Under Different Conditions of Feedback," Journal of Educational Psychology 55 (June 1964):171.

[21]John A. Zahorik, "Classroom Feedback Behavior of Teachers," Journal of Educational Research 62 (December 1968):147-50 passim.

[22]Brooks, Language, p. 45.

[23]Billows, Techniques of Language Teaching, p. 64.

[24]See Ronald Wardhaugh, "TESOL: Current Problems and Classroom Practices," in Teaching English as a Second Language: A Book of Readings, ed. Harold B. Allen (New York: McGraw-Hill, 1972), p. 13; Robert Lado, Language Teaching (New York: McGraw-Hill, 1964), pp. 35-37; and Frederick J. Bosco, "The Relevance of Recent Psychological Studies to TESOL," in Teaching English as a Second Language, ed. Allen, p. 374.

[25]Bolinger, "Theorist and Language Teacher," p. 28.

[26]See P. Corder, "Significance of Learner's Errors," International Review of Applied Linguistics 5 (November 1967):166-67; H. C. Dulay and M. K. Burt, "Goofing: An Indicator of Children's Second Language Learning Strategies," Language Learning 22 (December 1972):242; Freda M. Holley and Janet K. King, "Imitation and Correction in Foreign Language Learning," Modern Language Journal 55 (December 1971):494; and Margareta Olsson, Intelligibility: A Study of Errors and Their Importance (Gothenburg, Sweden: ERIC Document Reproduction Service, ED 072 681, 1972), p. 91.

[27]See Kenneth D. Chastain, "Behavioristic and Cognitive Approaches in Programmed Instruction," in Teaching English as a Second Language, ed. Allen, p. 56; and Bolinger, "Theorist and Language Teacher," p. 22.

[28]James W. Ney, "Towards a Synthetization of Teaching Methodologies for TESOL," TESOL Quarterly 7 (March 1973):4.

[29]See Emma Birkmaier, "A State of Turmoil and Evolution," in Foreign Languages and the School, ed. Donoghue, pp. 14-17; and Chastain, "A Methodological Study," p. 266.

[30]See John B. Carrol, "Current Issues in Psycholinguistics and Second Language Teaching," TESOL Quarterly 5 (June 1971):103; and Ney, "Towards a Synthetization," p. 3.

[31]Norbert Wiener, Cybernetics (Cambridge: M.I.T. Press, 1961), p. 11.

[32]Wiener, Human Use, p. 35.

[33]Ibid., p. 127.

[34]See Annett, Feedback, p. 168; Wiener, Human Use, pp. 107-111; and Rivers, The Psychologist, pp. 44-45.

[35]Wiener, Human Use, p. 84.

[36]Ibid., p. 26.

[37]See William O. Gay and Bobby L. Stephenson, "A New View of Reinforcement in Learning," Educational Technology 12 (May 1972):48-49; Joe B. Hansen, An Investigation of Cognitive Abilities, State Anxiety and Performance in a CAI Task Under Conditions of No Feedback, Feedback and Learner Control (Chicago: ERIC Document Reproduction Service, ED 065 600, 1972), pp. 8-9; Kent Henderson, "Reaction to Success and Failure in Complex Learning: A Postfeedback Effect," Journal of Experimental Child Psychology 10 (October 1970):214; Patricia Hutinger, "The Effects of Adult Verbal Modeling and Feedback on the Oral Language of Head Start Children," American Education Research Journal 8 (November 1971):611; David Rema et al., "Effects of Blank Versus Non-informative Feedback and 'Right' and 'Wrong' on Response Repetition in Paired-Associate Learning," Journal of Experimental Psychology 88 (April 1971):29; Glenn E. Simelbecker, Sustained Attention and Response Rates as a Function of Task Difficulty and Feedback Arrangements (Philadelphia: ERIC Document Reproduction Service, ED 066 024, 1972), p. 2; and

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[38]C. Kyle Packer and Toni Packer, "Cybernetics, Information Theory and the Educative Process," Teachers College Record 61 (December 1959):134-42 passim.

[39]Wiener, Cybernetics, p. 175.

[40]Aunett, Feedback, p. 89.

[41]Ibid., p. 120.

[42]Wiener, Human Use, p. 277.

[43]See Barbara M. Grant and Dorothey Grant Henning, The Teacher Moves: An Analysis of Non-Verbal Behavior (New York: Teachers College Press, 1971), passim; and Rivers, The Psychologist, p. 144.

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[45]Frank Smith, Understanding Reading (New York: Holt, Rinehart and Winston, 1971), p. 81.

[46]Ibid., p. 187.

[47]Ibid., passim.

[48]Travers, Essentials of Learning, p. 430.

[49]Smith, Understanding Reading, pp. 16-17.

[50]Rivers, The Psychologist, p. 119.

[51]Carl James, "The Diagnosis and Analysis of Error--Some Insights From Linguistics," Audio-Visual Language Journal 10 (Summer 1972):77.

[52]Rivers, The Psychologist, p. 126.

[53]See Persis T. Sturges, "Effect of Instructions and Form of Informative Feedback on Retention of Meaningful Material," Journal of Educational Psychology 63 (April 1972):102; and Persis T. Sturges, "Verbal Retention as a Function of the Informativeness and Delay of Informative Feedback," Journal of Educational Psychology 60 (January 1969):14.

[54]Smith, Understanding Reading, pp. 23-26.

[55]John A. Zahorik, "Pupils' Perceptions of Teachers' Verbal Feedback," Elementary School Journal 71 (November 1970):109-111.

[56]Smith, Understanding Reading, p. 21.

[57]Wilga M. Rivers, Teaching Foreign Language Skills (Chicago: University of Chicago Press, 1968), p. 138.

[58]Miller, Language and Communication, p. 207.

[59]Travers, Essentials of Learning, p. 215.

[60]See Arno A. Bellack, "The Language of the Classroom," in Teaching: Vantage Points for Study, ed. Ronald T. Hyman (New York: J. B. Lippincott, 1968), p. 93; and Zahorik, "Classroom Feedback Behavior," pp. 148-49.

[61]See David G. Ryans, "Teacher Behavior Theory and Research: Implications for Teacher Education," in Teaching, ed. Hyman, p. 38; and Wilbert W. Lewis, "Selected Concepts of Communication as a Basis for Studying Mental Health in the Classroom," in Teaching, ed. Hyman, p. 47.

[62]Wiener, Cybernetics, p. 163.

[63]Suzanne B. Hiscox and Adrian P. Mondfrans, Feedback Conditions and Type of Teaching Skill in Microteaching (Chicago: ERIC Document Reproduction Service, ED 064 249, 1972), p. 9.

[64]Caleb Gattegno, Teaching Foreign Languages in Schools the Silent Way (New York: Educational Solutions, 1963), p. 13.

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